

What is claimed is:

- 1 1. A method of producing parts from powdered metal comprising the steps of:
 - 2 a) providing a metallurgic powder comprising iron, 0-1.5 weight percent
 - 3 silicon, 0.4-0.9 weight percent carbon, 0.5-4.5 weight percent
 - 4 nickel, 0.5-1.0 weight percent molybdenum, 0-0.5 weight percent
 - 5 manganese, and 0-1.5 weight percent copper, the weight
 - 6 percentages calculated based on the total weight of the powder;
 - 7 b) compressing the metallurgic powder at a pressure of 25 to 65 tsi to
 - 8 provide a green compact;
 - 9 c) heating the compact to 2100°F to 2400°F for 20 to 60 minutes;
 - 10 d) holding the compact between 1000°F to 1900°F for 5 to 60 minutes,
 - 11 such that microstructure of the compact becomes mainly Pearlite;
 - 12 e) increasing the density of at least a portion of the compact to greater than
 - 13 7.6g/cc;
 - 14 f) heating the compact to 1650°F to 2100°F for 20 to 80 minutes;
 - 15 g) cooling the compact at a rate of 150°F to 250°F per minute; and
 - 16 h) heating the compact to 300°F to 1000°F for 30 to 90 minutes, such that
 - 17 the microstructure of the compact becomes tempered martensite, 0
 - 18 to 20% bainite, and less than 5% retained austenite and has a
 - 19 hardness of 27 to 50 HRC.
- 1 2. The method of claim 1, wherein the parts are sprockets.
- 1 3. The method of claim 2, wherein the sprockets have a tooth density of 6.75g/cc to
- 2 7.25g/cc.
- 1 4. The method of claim 1, wherein the step of compressing the metallurgic powder
- 2 produces a compact with a density of 6.4g/cc to 7.4 g/cc.

- 1 5. The method of claim 1, wherein the compact is heated in step c) to a temperature of
2 2300°F for 40 minutes.
- 1 6. The method of claim 1, wherein the compact is held in step d) at a temperature between
2 1000°F to 1800°F.
- 1 7. The method of claim 1, wherein the compact is held in step d) at a temperature between
2 1500°F to 1900°F.
- 1 8. The method of claim 1, wherein the compact is not subjected to additional cooling or
2 heating between steps c) and d).
- 1 9. The method of claim 8, wherein the compact produced in step c) has a critical
2 temperature and in step d) is held below the critical temperature.
- 1 10. The method of claim 8, wherein the compact produced in step c) has a critical
2 temperature and in step d) is held at the critical temperature.
- 1 11. The method of claim 1, wherein the Pearlite may be spheroidized.
- 1 12. A method of producing parts from powdered metal comprising the steps of:
- 2 a) providing a metallurgic powder comprising iron, 0-1.5 weight percent
3 silicon, 0.4-0.9 weight percent carbon, 0.5-4.5 weight percent
4 nickel, 0.5-1.0 weight percent molybdenum, 0-0.5 weight percent
5 manganese, and 0-1.5 weight percent copper, the weight
6 percentages calculated based on the total weight of the powder;
- 7 b) compressing the metallurgic powder at a pressure of 25 to 65 tsi to
8 provide a compact with a density of 6.4 to 7.4 g/cc;
- 9 c) heating the compact to 2100°F to 2400°F for 20 to 60 minutes and
10 cooling the compact to room temperature;
- 11 d) heating the compact to 1650°F to 2100 °F for 20 to 80 minutes;
- 12 e) cooling the compact at a rate of 150°F to 250 °F per minute; and

13 f) heating the compact to 300°F to 1000°F for 30 to 90 minutes.

1 13. The method of claim 12, wherein the compact is heated in step c) is to a temperature of
2 2300°F for 40 minutes.

1 14. A method of producing parts from powdered metal comprising the steps of:

2 a) providing a metallurgic powder comprising iron, 0-1.5 weight percent
3 silicon, 0.4-0.9 weight percent carbon, 0.5-4.5 weight percent
4 nickel, 0.5-1.0 weight percent molybdenum, 0-0.5 weight percent
5 manganese, and 0-1.5 weight percent copper, the weight
6 percentages calculated based on the total weight of the powder;

7 b) compressing the metallurgic powder at a pressure of 25 to 65 tsi to
8 provide a compact with a density of 6.4 to 7.4 g/cc;

9 c) heating the compact to 1650°F to 2100 °F for 20 to 80 minutes;

10 d) cooling the compact at a rate of 150°F to 250 °F per minute; and

11 e) heating the compact to 300°F to 1000°F for 30 to 90 minutes.